where, $V(r_x)$ represents the potential at any desired point defined by the three-dimensional vector r_x and, V_i represents each of n known potentials at a point defined by the three-dimensional vector r_i and, k is an exponent that matches the physical behavior of the tissue medium.

From the foregoing description, it will be apparent that the method for determining a continuous map of the electrical activity of the endocardial surface of the present invention has a number of advantages, some of which have been described above and others of which are inherent in the invention. Also modifications can be made to the mapping probe without departing from the teachings of the present invention. Accordingly the scope of the invention is only to be limited as necessitated by the accompanying claims.

We claim:

1. A method of mapping the volumetric electrical potential distribution of the heart chamber arising from electrical activation in the myocardium comprising the steps of:

a) positioning an electrode array 19 within the endocardial cavity;

b) positioning an reference electrode 24 at the surface of said heart chamber at a known distance from said array 19, said reference electrode 24 and said array 19 together defining a reference position;

c) measuring the volume and shape of said heart chamber,

generating volume measurement data;

d) computing the position of said array 19, from said volume measurement, and from said endocardial reference position, generating array position measurement data;

e) measuring the electrical potentials on said array 19, generating electrical potential measurement data;

f) computing the three-dimensional volumetric electrical field distribution of said heart chamber volume from a spherical harmonic series expression containing said electrical potential measurements, and said array position measurement data;

g) displaying said volumetric electrical field distribution.

2. A method of mapping the two-dimensional electrical potential distribution within a wall of the heart chamber arising from electrical activation in the myocardium comprising the steps of:

a) positioning an electrode array 19 within the endocardial cavity;

b) positioning an reference electrode 24 at the surface of said heart chamber at a known distance from said array 19, said reference electrode 24 and said array 19 together defining a reference position;

c) measuring the volume and shape of said heart chamber, generating volume measurement data;

d) computing the position of said array 19, from said volume measurement, and from said endocardial reference position,

generating array position measurement data;

e) measuring the electrical potentials on said array 19, generating electrical potential measurement data;

f) computing the three-dimensional volumetric electrical field distribution of said heart chamber volume from a spherical harmonic series expression containing said electrical potential measurement data, and said array position measurement data;

g) defining a set of computed potential points on the wall of said heart;

h) inserting an intramural electrode into said wall defining a subsurface electrode site, generating a subsurface voltage measurement;

i) computing the two-dimensional potential distribution from the center of gravity calculation from said computed potential points from step g) and from said subsurface voltage measurement from step h), generating two-dimensional map data;

j) displaying a two-dimensional potential distribution map from said two-dimensional map data.

3. The method of claim 1 or claim 2 wherein said electrode array has more than twenty electrodes.

4. The method of claim 1 or claim 2 wherein said step c) comprises:

c1) generating a sequence of impedance plethysmography signals on said array;

c2) measuring the resultant sequence of plethysmographic signals characterizing said heart volume.

c3) generating said volume measurement data from step c2.